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OBSERVATIONS AT THE TRI-STATE GREAT BLUE HERON NESTING COLONY

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Notes on the distribution of colonies of the familiar Great Blue Heron, *Ardea herodias*, in Kansas have appeared occasionally on these pages. Breukelman (1951) described a colony of about 46 nests in Chase County, that had been at the site since at least 1908. Stephens (1954) summarized the distribution of known colonies; he visited 30 colonies in 17 counties, counted 1024 old and new nests, and listed the number per colony from 3 to 187 (average 34.13). Andrews and Stephens (1956) reported 64 active colonies containing 1505 nests in 33 counties. Zimmerman (1968, 1969, 1979) stated that Great Blue Herons were seen in 1967 in 32.1% of 28 routes, and in 1968 in 53.8% of 26 routes in the Breeding Bird Survey in Kansas, and he listed this species as one possibly increasing in breeding population in the state in 1979. Stephens (1980) has prepared a more recent report of the distribution of colonies currently known in Kansas as well as notes on the species' natural history.

None of the published reports gives much information about colonies in Crawford County and none about Cherokee County in extreme southeastern Kansas; apparently few colonies have existed there in recent years. Rising (1965), in his report on birds of Cherokee County, stated: "So few Great Blue Herons were found that it is reasonable to guess that they were migratory stragglers or otherwise non-breeding birds". There were unconfirmed reports of one or more colonies along Lightning Creek west of Pittsburg several decades ago. Yet, even though this bird is seen in all months except December and January in the two counties (rarely, individuals may remain through the winter), and despite the availability of what to the human eye appear to be good potential nesting sites, no colonies were known for at least 30 years prior to 1979. On 25 March of that year, David G. Fuller, while canoeing on Cow Creek, discovered a small colony of three nests built in two tall green ash trees, *Fraxinus pennsylvanica*, in an isolated site about 5 km southeast of Pittsburg.

A partial explanation for the current paucity of colonies in extreme southeastern Kansas is that this heron, capable of long flight for food, has large, well-established colonies in immediately adjacent Jasper and Newton Counties, Missouri. Thus some of the individuals seen at feeding areas in southeastern Kansas may be either non-breeding or are birds which have flown across the nearby state line into Kansas (and probably Oklahoma) from the large colonies in Missouri. Three such colonies are known: one each south of the towns of Jasper and Carthage in Jasper County, and the third, the subject of this report, southwest of Joplin in Newton County.

The "tri-state colony", located approximately 2.5 km southeast of the Kansas-Oklahoma-Missouri corner marker, was discovered by Fuller on 8 April 1979, along a small unnamed stream about 11 km southwest of Joplin. Local residents have known of the "cranes" at the site for at least fifteen years. Formerly semi-isolated from humans, the colony now is adjacent to the extensive new Loma Linda Estates. Plainly visible to even the casual observer before foliage develops, the colony fortunately seems to be the object of some protective pride by local residents.

Sixty-three nests, most believed occupied, were distributed in 11 large sycamore trees, *Plantanus occidentalis*, all about 30 m high, ranging from 0.53 to 1.93 m DBH; the number of nests per tree varied from 2 to 17. The site is ringed by low forested hills on three sides and by unforested hills of the new housing development to the east. Much undergrowth and many smaller trees of several species are present; cattle graze in adjacent irregular small pastures. The nest trees are arranged in 3 subgroups beside the creek, which itself flows into Oklahoma within 2 km to the west.

The colony was visited 2 or 3 times per week from 8 April until all the birds had left in mid-July. Observations were made from a platform 4.6 m above ground at the immediate edge of the colony and from a hillside about 175 m east of the colony's east edge. The latter point provided an unobstructed view of the entire area. Even when foliage was fully grown, about 20 nests could be seen at eye level and were observed at length through a 30-power spotting scope. The maximum number of adults countable at any one time was about 70; others were at feeding areas which extended into all 3 states.

The nests were much like those described by Palmer (1952): "Newly constructed nests are rather flimsy, flat platforms of sticks as small as 18 in. across, but older nests are rather substantial, bulky structures about 3-4 ft. across, with an inner saucer-shaped depression about 10 in. across and 3 in. deep". The herons will repair existing nests while adding new nests each year. Several nests blown to the ground revealed the use of the soft sycamore seed balls as lining for the shallow cup.

A typical clutch is 4 eggs, but sets of 3 are not uncommon, and sets of up to 7 have been reported. No counts were attempted at the tri-state colony. Both parents participated in incubation, taking shifts of 4 to 6 hours, and both shared in feeding and protection of the young.

Egg fragments, evidence of hatching, were first found on the ground on 13 April and additional fragments were seen during the next 2 days. Egg laying had therefore occurred on about 16 March. Some shells were nearly complete. One was 6.8 by 4.5 cm, pale blue, immaculate, and slightly rough in texture.

During the days from discovery of the colony to egg hatching, 8-13 April, a dozen or more adults could be clearly seen perched at any time in trees of the surrounding hills, within 300 to 400 m of the nests. The number of such perched adults markedly decreased thereafter, probably in response to the necessity of gathering food for the demanding chicks. A nearly continuous stream of adults coming to and leaving the colony was evident, but no regular flight patterns could be determined. When entering the colony during periods of strong wind, the herons started their descent to the canopy layer from higher altitude, backs to the wind, legs withdrawn, wings held in an acute "V", then, at about halfway down, they turned into the wind, gliding skillfully, legs extended, braking abruptly to land at or near the nests.

Ford (1957) accurately stated: "The young are very uncouth when just hatched. The bills, legs, and neck are very long. By the end of a week the head and neck are covered sparingly with long tufts of silky, dark gray down; the young feather quills have soft blue sheaths. At the end of four weeks, body and wings are well covered with dark slate-colored feathers. At this time the bird is able to stand erect on the nest or near it".

When an adult lands at the nest, the young respond vigorously, competing for the attention of the parent which holds its head high, paying no apparent attention to the sparring young. Food is passed from the parent's bill directly to the young's in a rough manner in which it appears the young force the parent to regurgitate. The diet consists of various kinds of fish, frogs, snakes and insects. For about four weeks the young receive regurgitated food directly. Thereafter, macerated food is regurgitated by the parent onto the edge of the nest from which it is picked up by the young. By the ninth week the young receive whole fish. Human observers under the nest may be "bombarded" when the birds accidentally allow the fish to fall; this "rain of fish" is accompanied with droppings jettisoned over the edge of the nests, thoroughly whitening the vegetation and ground below.

As related by Bent (1963): "The young herons are particularly noisy at feeding times and as this is an almost continuous performance in a large rookery, there is always more or less chattering to be heard which sounds like the barking of small puppies or the squealing of young pigs". The young at the tri-state colony could be heard at a distance of at least 100 m.

By 3 July the majority of the young had left the colony; a few were seen there on 13 July, but all were gone by 16 July. Adults had first come in mid-February (confirmed in 1980); thus the time period from arrival to abandonment at the tri-state colony in 1979 was approximately 22 weeks. A more thorough study of this colony during 1980-81 is in progress.

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THE BREWER'S SPARROW IN KANSAS: STATUS AND BREEDING HABITAT

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Status

The Brewer's Sparrow (*Spizella breweri*) is a breeding bird of the timberline-shrub habitats of southwestern Yukon and central British Columbia as well as the arid regions of the Great Basin, southern California, northern New Mexico, and on eastward to the front range of Colorado and into western South Dakota (Bent, 1968). This bird is most commonly found at altitudes of 4,500 to 10,000 feet MSL, corresponding to the arid shrub deserts and grasslands which it prefers (Bent, op. cit.).

The Brewer's Sparrow is considered a common migrant through western Kansas and is observed most often among sand sagebrush (*Artemisia filifolia*) grasslands and riparian habitats (Rising, 1974). It often travels in large flocks with other sparrows such as the Clay-colored Sparrow (*Spizella pallida*), Chipping Sparrow (*Spizella passerina*), and the White-crowned Sparrow (*Zonotrichia leucophrys*) (Ely, 1971). Two mid-summer records from Morton County in the far southwestern corner of the state had suggested the possibility of this species nesting in Kansas. King and Andrews (1954) saw 1 bird on 19 August 1954, and Easterla (1964) reported 1 bird on 17 July 1963.

Confirmation of this bird's breeding in Kansas came on 17 and 19 May 1978, when Schwilling and J. Allen White of the Kansas Fish and Game, and Thompson of

Southwestern College discovered several breeding pairs of Brewer's Sparrows in sandhills covered with sand sagebrush and forbs, 5¼ mi N and 9½ mi E of Elkhart in Morton County. At this time 2 females were collected and are in the collection of Southwestern College, Winfield. One bird (SC 2794) was laying eggs, having 3 collapsed follicles and 1 ovum in the oviduct. The other specimen (SC 2795) had no collapsed follicles but had 3 enlarged ova just about to erupt. A nest with 4 eggs was found and collected while a total of 6 singing males was counted at this location.

During the summer of 1979 continued research on the Brewer's Sparrow in Morton County resulted in the discovery of 6 more nests and 24 singing males from 8 different localities in Morton County. On 27 May 1979 3 nests were discovered and marked, 5¼ mi N and 9½ mi E of Elkhart. Two nests contained 4 eggs each, while the third nest contained 3 eggs and 1 Brown-headed Cowbird (*Molothrus ater*) egg. On 3 June 1 nest had 3 small nestlings, a second had 4 eggs, and the third had 2 Brewer's nestlings and 1 cowbird nestling. On 7 June all 3 nests were empty but still intact. Since all 3 nests were found after a full clutch was laid, their incubation period could not be determined. We suspect that the nestlings in each nest were lost to predators since most likely not enough time (5-8 days) had elapsed for them to be successfully fledged.

On 9 June a fourth and fifth nest were found within the Brewer's Sparrow colony. One nest held 2 fledglings who quickly abandoned their nest when disturbed. The other nest was empty. The sixth nest from Morton County was found in a colony of 8 singing males located 6 mi N and 2¼ mi W of Rolla. This nest, found on 11 June, was empty but intact. Brewer's Sparrows were last observed that summer in Morton County on 19 July. On that day 2 adult birds were seen foraging in a shortgrass pasture with 2 juveniles, only 1 mile from one of the breeding colonies.

In southeastern Colorado the Brewer's Sparrow is a fairly common migrant and a common breeder on the high plains of north-central Colorado. Elsewhere it breeds throughout the western half of Colorado in the Sonoran and Transition zones (Bailey and Niedrach, 1965). In New Mexico this bird is restricted to the northern one-third of the state at altitudes between 6,500 and 8,000 feet where it is associated with shrub-grasslands (Ligon, 1961).

The Brewer's Sparrow in Oklahoma is a common transient through the western half of the Panhandle. In June 1957 this bird was found to be breeding in large numbers west of Boise City, Cimarron County in sand sagebrush pastures. Four nests were found at this location but there have been no other published breeding records since that time for Oklahoma (Sutton, 1974).

Breeding Habitat

The known breeding habitat of the Brewer's Sparrow in Kansas is restricted to several square miles of sand sagebrush grasslands located south of the Cimarron River in Morton County. This area is composed of rolling sand hills deposited by the force of wind and water. The climate is characterized by an annual rainfall of 17 inches and temperatures ranging from 99°F to 49°F during the summer. The altitude at this point is 3,500 feet MSL (Soil Conv. Ser., 1960).

The habitat in which the Brewer's Sparrow is found is the result of past abuses to the land by man, involving overgrazing and soil erosion. The climax prairie that once existed here and which was dominated by grasses is now depleted and has been replaced by shrubs and weedy forbs such as sand sagebrush and annual sunflowers (*Helianthus annuus*).

The 24 singing males discovered in 1979 seemed to be clumped into small breeding colonies which were isolated from each other by several miles of what seemed to be similar habitat. The 2 largest colonies were composed of 8 and 6 singing males and were separated by 11 miles of rangeland.

The colony containing 6 singing males covered an area of 10 to 15 acres of sand sagebrush grasslands located in a shallow basin. Using the step-point method (Evans and Love, 1957) for vegetation analysis, it was determined that in the 20 acre area where the colony was situated the vegetation was composed of 36% sand sagebrush, 54% forbs, and 10% grasses. Dominant forbs included annual sunflower, lambsquarter (*Chenopodium album*), dayflower (*Commelina crista*) and

plains yucca (*Yucca glauca*). Grasses such as sand dropseed (*Sporobolus cryptandrus*) and sand lovegrass (*Eragrostis trichodes*) were sparse and widely dispersed.

The vegetation in general was low (\bar{x} = 25 cm) and unevenly distributed in late May but by late June, with the rapid growth of annual sunflowers, the general character of the habitat changed dramatically with an increase in vegetation height (\bar{x} = 61 cm) creating an almost solid stand of dense sunflowers interspersed with sagebrush.

In this particular colony a total of 5 nests was discovered. Each nest was a small bowl-shaped, grass structure that was placed 10 to 36 cm (\bar{x} = 19 cm) off the ground in the center of a sand sagebrush. These 5 shrubs in which a nest was placed averages 71 cm in height while the vegetation directly around the nest averaged 36 cm in early June suggesting that these birds may choose the larger, bushier sagebrush as nest sites.

Throughout its range the Brewer's Sparrow will usually place its nest in shrub vegetation. In the Big Basin region this usually means nesting in big sagebrush (*Artemisia tridentata*) while in other areas commonly used shrubs include rabbitbrush (*Chrysothamus nauseosus*), saltbush (*Atriplex* sp.), and mountain mahogany (*Cercocarpus* sp.) (Bent, 1968.).

Large areas of the Arkansas and Cimarron River valleys in western Kansas are covered by the edaphic sagebrush grassland community and this would seemingly provide adequate habitat for the shrub-nesting Brewer's Sparrow. Should this and other ecological and climatic factors prove favorable for this species, the Brewer's Sparrow may someday become a regular breeding bird in western Kansas.

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DISTRIBUTION AND ABUNDANCE OF SNOWY PLOVERS IN KANSAS AND NORTHERN OKLAHOMA

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The Snowy Plover (*Charadrius alexandrinus*) has been "Blue-listed" since the inception of the list in 1971 (Arbib 1971). The species on this list have been identified as birds which are believed to be experiencing a non-cyclic population decline due to a variety of reasons. Habitat loss and human disturbance have been credited for much of the decline of the Snowy Plover. The Piping Plover (*Charadrius melodus*) and the Least Tern (*Sterna albifrons*) utilize the same or similar habitat and have also been on the Blue-list for the same reasons. Recent

publications have attempted to indicate population size of the Piping Plover (Cairns and McLaren 1980) and the Inland Least Tern (*S. a. athalassos*) (Downing 1980). Recent studies along the West Coast have helped determine the status of the Snowy Plover in that area (Page and Stenzel 1979, Widrig 1980, Wilson 1980). The findings of these studies on the Snowy Plover have, for the most part, indicated a decline in various parts of its range in the west coastal states. As a result of these findings, Ruth Wilson and Dr. Charles Meslow of the Oregon Cooperative Wildlife Research Unit and others organized a Western Snowy Plover Workshop held in October 1980. This workshop allowed researchers and federal and state agency personnel to exchange information and consider possible action to be taken which would benefit the species.

During the 1980 breeding season I completed the sixth year of field work on the Snowy Plover in the past 11 years. The following is a summary of the field data collected since 1970 and a review of the pertinent literature. Much of the data included from the literature is incomplete. Locations are often cited by authors, but very little information on numbers of birds is included. The purpose of this paper is to create further interest in obtaining more accurate data on the current and possible future status of the Snowy Plover in this region.

Kansas

Historically the Snowy Plover was known to nest along the Cimarron River in Comanche County, Kansas from a collection by Goss in June 1886 (Tordoff 1956). They probably nested along the Arkansas River and several other rivers in Kansas but no early records exist to confirm this. Mosby and Lynn (1957) did not find any breeding plovers in Kansas in 1955. There are nesting records from Cheyenne Bottoms in Barton County, Kansas and the salt marshes in Stafford County, Kansas since 1959. Abundance data is sketchy at best, with one to four nests reported (Parmalee, et al, 1969). In addition to these two areas, Zuvanich and McHenry (1964) found the species nesting in Finney and Rooks Counties (Webster Reservoir), and suspected breeding in Scott (Dry Lake), and Trego (Cedar Bluffs Reservoir) Counties in 1963. Johnston (1964) indicates breeding records from Meade and Clark Counties in addition to Barton, Stafford, and Comanche Counties. Tom Cannon (pers. comm.) reported unfledged young at Wilson Reservoir (Russell County) in 1976.

Studies that I have conducted at Cheyenne Bottoms Wildlife Area have indicated a drastic decline in numbers in the past 10 years (Table 1). This decrease is probably directly related to water conditions. Water levels in favorable nesting areas have been high the past two years and birds have not remained in the area to breed. On the other hand, the number of breeding Snowy Plovers at Quivira National Wildlife Refuge has remained fairly stable. I estimated 100+ birds in the area in 1970, 1971, 1978, and 1979. In 1980 I located 54 nests with eggs and estimated possibly 15 to 20 more pairs could be nesting in the more distant parts of the salt flats.

TABLE 1. Breeding Population Density of Snowy Plovers at Cheyenne Bottoms Wildlife Area, 1970 through 1980.

	1970 ¹	1971 ¹	1978	1979	1980
Nests with eggs	20	27	16	—	4
Additional broods ²	5	5	3	2	—
Possible additional pairs ³	2-3	1-2	2	2	2
Maximum possible number of adults	56	68	42	8	12

¹ data taken from Boyd 1972

² brood known to be from nests that were not located

³ the number of additional pairs believed to be breeding, due to several possible factors, but neither nests nor broods were ever found

In the summer of 1980 Jean, Ed, and Margaret Schulenberg were contracted by the Kansas Fish and Game Commission to census Least Terns in the state. At the same time they noted numbers and breeding status of Snowy Plovers. Their work was mostly confined to the southern and central part of the state and probably includes 90 to 95 percent of the population in the state. They censused 14 birds nesting along the Cimarron river in Meade County and 8 birds nesting in Clark County. Least Terns, which often nest in association with Snowy Plovers, were found in Comanche County and along the Ninnescah River in Kingman County, but no Snowy Plovers were found nesting at either site. Gene and Eulalia Lewis (pers. comm.) noticed 8 Snowy Plovers at Cedar Bluffs Reservoir in Trego County in June, but apparently none were nesting. Taking all of these censuses into account, the total breeding population in Kansas in 1980 could be estimated at 150 to 200 birds.

Northern Oklahoma

Sutton (1967) has breeding records for Oklahoma from Great Salt Plains National Wildlife Refuge in Alfalfa County, along the Cimarron River in Beaver, Harper, and Woods Counties, along the Canadian River in Oklahoma and Cleveland Counties, and the Big and Little Salt Plains (Edith Salt Flats) in Woods County. He suspected nesting along the Canadian River in Blaine and Dewey Counties and various places in the Red River watershed.

Recent studies at Great Salt Plains National Wildlife Refuge indicated a breeding population of 325 individuals in 1977 and 260 in 1978 (Grover 1979). Apparently there have not been any other studies relating to the abundance of Snowy Plovers in other parts of Oklahoma. Grover (1979) indicated that the Big and Little Salt Plains in Woods County, Oklahoma both support sizable breeding populations of Snowy Plover.

Discussion

The major threat to breeding populations of Snowy Plover in Kansas and Oklahoma is modification of the breeding habitat by man. As has already been pointed out, water levels the past two years at Cheyenne Bottoms have been high early in the breeding season. Several marked birds and 15 to 20 unmarked birds were seen in the area in late May both years but were no longer present in late June when water levels finally receded. The assumption is that they moved elsewhere to attempt to breed. Unlike the Pacific or Gulf coastlines, however, nesting habitat in the interior is widely spaced. Due to the relatively small number of birds breeding in Kansas and the extremely limited habitat that is suitable for breeding, it is imperative that management policies appropriate for this species be established at Cheyenne Bottoms. Once this is accomplished, it is hoped that the Snowy Plover will again nest at Cheyenne Bottoms at levels approaching those found in the early 1970's.

The second type of modification affecting the Snowy Plover is irrigation wells which have lowered the water table in most western Kansas and Oklahoma rivers. The water table around the Arkansas River has been lowered so much that there is no longer any water on the surface most of the time west of Dodge City (Bill Hanzlick, pers. comm.). This, of course, eliminates the possibility of the species nesting there. Unfortunately I do not envision any improvement in this situation and would anticipate similar problems developing along the Cimarron River in the future.

The third type of modification involves the U. S. Army Corps of Engineers' Arkansas-Red River Basins Chloride Control Project (Grover 1976). With this series of projects, reasonably fresh water would be diverted around alkaline basins to prevent contamination of the fresh water so that it can be available for irrigation and domestic uses. Grover (1978) and Purdue (1976) both point out the necessity of fresh water for the successful breeding of the Snowy Plover, and limiting flow to a small amount during the breeding season may not be sufficient to maintain their food supply. The areas of major importance to the plover which have been considered for these projects are Rattlesnake Creek which flows into Quivira N. W. R., the Cimarron and adjacent tributaries around the Big and Little Salt Plains in Woods County, Oklahoma, and the various tributaries which

currently empty into Great Salt Plains Lake. These fresh water diversion projects probably pose the greatest threat to the future of the Snowy Plover in both Kansas and northern regions of Oklahoma due to the size of the areas to be affected.

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